

FEN GRASSLAND IN SOUTHERN SWEDEN

THE APPLICATION OF PLANT ECOLOGY TO A
PROBLEM OF NATURE CONSERVANCY

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TO MY PARENTS

Majvivan finns inte längre - inte nånstans i vångarna i Harjagers härad, inte i mossen på det som var min fars ägor. Det är vad som känns mest sakneligt, som de gamle sa. /.../ Det underliga är att markerna där den brukade växa inte är försvunna. Mossen därhemma blev inte mer utdikad än min far orkade med. Där är rentav sankare än då - men kring björken, som finns kvar, har växt en djungel av tråkigt kratt (man kunde nästan tro att mossen blivit fridlyst) som kväver och utrotar all markens blomning av örter.

Ivar Harrie (Hem till Skåne, 1961)

Den verkliga sanningen vet bara professorerna. Men den är så invecklad att den kan inte användas.

Harry Martinsson

(Vägen till Klockrike, 1948)

FEN GRASSLAND IN SOUTHERN SWEDEN
The application of plant ecology to a
problem of nature conservancy

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Abstract The few remaining sites of calcareous fen grassland in southern Sweden are of considerable scientific and cultural value. They are rich in species, many of which are endangered. Their character varies with edaphic and climatic conditions, with the distribution of species and with cattle raising habits. Though physiognomically dominated by low-growing <i>Carex</i> spp and <i>Poaceae</i> spp, they are usually rich in herb species. A phytosociological survey based on the literature is presented. The succession from fen grassland to tall-herb vegetation was investigated using ORDINA ordination technique (PCA - principal components analysis) at a site where grazing had been discontinued 15 years previously in part of the study area. Results showed that succession had been rapid, profoundly changing the species composition and reducing species number and spatial variation. Mowing as a means of restoration was also investigated here; the results showed that when once the original flora has disappeared, restoration is a difficult matter. The vegetation dynamics of fen grassland is discussed in more general terms; its traditional use and the physiognomy are described. Criteria for selecting sites for conservation are suggested and relevant methods of management are recommended. It is emphasized that the use of fertilizers should be restricted, and the natural water table maintained. It is suggested that calcareous, abandoned gravel- and sand-pits in which the water table is not far below the bottom of the pit should be managed as meadow or pasture. This would be a means of supplementing existing sites of fen grassland.			
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The dissertation is based on the following four papers:

- (I) Regnéll, G. 1976. Den sydsvenska kalkfuktängen i litteraturen. -Meddn Avd. Ekol. Bot., Lunds Univ. 4:3. 40 pp.
- (II) Regnéll, G. 1980. A numerical study of successions in an abandoned, damp calcareous meadow in S Sweden. -Vegetatio 43:123-130.
- (III) Regnéll, G. 1982. Kalkfuktängar i södra Sverige. Naturvårdsvärden och skötselproblem. -Meddn Växtekol. Inst., Lunds Univ. 48. 63 pp.
- (IV) Regnéll, G. 1986. Restoring fen grassland. A study of mowing in southern Sweden.

Reference to the papers is made by their Roman numerals.

Paper (II) is also available in a more detailed version in Swedish: Regnéll, G. 1979. Vegetationsförändringar vid upphörande bete i en skånsk kalkfuktäng. Utvärdering och tolkningsmöjligheter med datateknik. -Svensk Bot. Tidskr. 73:139-159.

INTRODUCTION

What is the scientific and cultural significance of fen grassland in southern Sweden; what is the best type of management?

These are the two basic problems dealt with in this study. More specifically, the following problems have been examined:

1. What are the characteristics of fen grassland in southern Sweden regarding
 - (a) floristics and phytosociology
 - (b) environmental conditions and ecology
 - (c) traditional management and ecology
 - (d) succession and vegetation dynamics
 - (e) past and present changes in land-use; consequences for the future?
2. Which criteria are relevant when selecting sites for nature conservation?
3. What restrictions should be imposed and what methods of management should be applied if fen grassland is to be conserved?
4. Where fen grassland has been abandoned is it feasible to attempt restoration?
5. Can new fen grassland areas be established?

The conclusions from this study and from Tyler (1981) were used

as the basis for the official recommendations on management of fens and fen grassland published by the National Swedish Environmental Protection Board (Gustafsson 1983).

THE WORK

Literature on fen grassland floristics and phytosociology was reviewed and summarized (I) - problem 1a. It was found that the Swedish concept 'kalkfuktäng' (fen grassland) and other similar concepts had obviously been used inconsistently. Many interesting questions regarding the phytosociological relations between different kinds of fen grassland were raised. In particular it was evident that little had been done on succession in fen grassland.

Since fen grassland is species-rich it does not readily lend itself to the study of succession. However, some degree of information is essential for conservation purposes. In (II), which includes methodological work, the potential rate of change is discussed, based on observations made at a site in southernmost Sweden (problem 1d and to some extent 1b and 1e). At this site the change proved to have been alarmingly rapid in the field that had been left ungrazed for 15 years; the species composition had changed profoundly, species number and spatial variation was reduced.

During the course of the investigation, it became obvious that for management purposes, an integrated approach is necessary: information on local management history, the geology and hydrology of the area, together with the biological factors, is essential for an understanding of current changes and for determining future management. The necessity for this approach has not always been manifest in the policy of conservation authorities. In (III) I discuss acceptable criteria for selecting fen grassland sites for conservation; restrictions and regulations called for in the administration of fen grassland nature reserves; and the practical management of fen grassland under varying circumstances (problems 1c, 1e, 2, 3, 5 and to some extent 4). I am happy to be able to say that this integrated approach has now been adopted by The National Environmental Protection Board (Naturvårdsverket) as can be seen in Gustafsson (1983).

Restoration measures are often contemplated if the grazing pressure has been too light or mowing inadequate. Paper (IV) is based on results from a mowing experiment (problem 4). It is shown that too much faith should not be placed in restoration. Once the original flora has disappeared it is unlikely that restoration attempts will be useful.

SUPPLEMENTARY COMMENTS

Since the publication of papers (I-III), research has been published by other workers on the topics dealt with here and new problems have arisen. I therefore wish to add some notes (1, 2

below) in connection with my earlier papers, and on an additional field for future research (3):

1. Terminology; phytosociology

As regards terminology, 'fen grassland' as recently used by Wheeler (1980) corresponds most closely to my use of the Swedish concept of 'kalkfuktäng'. Wheeler (1980) uses the term mainly for the Junco-Molinion (a Molinietales Alliance in the Molinio-Arrhenatheretea); I include Swedish vegetation types related to the Caricion davallianae (Tofieldietalia in the Parvocaricetea) (sensu Westhoff & den Held 1969, p. 202).

Tyler has published detailed work on Schoenus vegetation (1979a, b) and on southern Swedish calcareous fens in general (1981); both include information on fen grassland. She also revised and completed the extensive material on fens and fen grassland collected by the late Dr Stig Waldheim (Tyler & Waldheim 1983).

2. Micro-patterns in fen grassland

Recent work has been done by Bakker et al. (1984) on micro-pattern in grassland grazed by sheep.

A characteristic feature of many fen grassland sites is the mosaic of tussocks and depressions, caused by the trampling. This micro-pattern seems to be fairly stable, the cattle preferably placing their feet in the depressions (II). Bakker et al. (1984, p. 156 f.) state that the larger pattern formed by alternating heavily and lightly grazed areas in a pasture (and within a single plant community) may also be relatively stable; the heavily grazed parts, where the quality of the forage is better, attract the animals again and again, giving rise to a less-than-random change in the pattern.

3. Precipitation and fen grassland

Change in the chemical composition of the precipitation, which may lead, for instance, to acidification in tussocks, has been discussed (III). However, precipitation as a source of extra nitrogen must also be considered; from data in Malmer & Wallén (1980) it can be concluded that wet deposition of N (as the sum of nitrate-N and ammonium-N) in southern Sweden increased by 30-50% from the period 1947-62 till the period 1962-76 to 6-12 kg N/ha; dry deposition contributes about 1 kg N/ha. Though arable fields receive considerably more N through the addition of fertilizers (50-200 kg N/ha), 6-12 kg N/ha is a substantial amount that presumably leads to an accumulation of nitrogen in the soil and vegetation. An equilibrium may be reached at higher levels of N content, but even so effects on species composition in fen grassland must be profound.

RECOMMENDATIONS FOR CONSERVATION

Fen grassland is a threatened vegetation type in Sweden. The situation in other parts of Europe is even more discouraging; in



many countries fen grassland seems to be vanishing even more rapidly than it is here and as a consequence the few remaining Swedish sites have an important international role. Since fen grassland sites in Sweden are generally of limited size, it should be possible to effectively conserve them.

The main recommendations for planning and management can be summarized as follows:

Selection for conservation

Criteria suggested for selection of a fen grassland conservation site in order of priority:

1. The site has been continuously mown and threatened species that are dependant on mowing still exist.
2. The site supports other threatened species.
3. The site has been continuously mown or grazed, or both, for at least a century (without the addition of fertilizers).
4. The site is situated in an area where fen grassland sites are rare.
5. The site measures more than 5 ha.

Requisite information for determining guidelines for management

Information on the following should be acquired:

1. Vegetation and soils (with maps).
2. Past and present land-use.
3. Flora, including rare and threatened species.
4. Fauna, at least some invertebrate groups such as molluscs.
5. Potential problems:
 - (a) Modification of hydrological conditions
 - (b) Succession
 - (c) Use of fertilizers
 - (d) Changes in land-use and management
 - (e) Public recreation.
6. Local farming and availability of grazing animals.

Aims

Many management combinations can be considered; it is necessary first to formulate the main aim. Usually multiple use is possible, but that is not always the case.

Possible aims to consider are:

1. Conservation of or creation of an area of general biological and scientific significance.
2. Preservation of threatened species.
3. Preservation of a species-rich flora.
4. Maintaining traditional management in the area.
5. To make the area available to scientific research including experimental work.
6. Use of the area for recreation.
7. Use of the area for educational purposes.

Practical management

Points to be considered:

1. Mowing should be performed at the traditional time for the area. In the extreme south of Sweden fen grassland was usually mown from the beginning of July, in other parts of southern Sweden from the middle of July, and was often not completed until some time in August. Fen grassland needs to be mown every year. It is also important that no vegetation is left around stones, trees and other obstacles which entails skill with a scythe. As a standing rule, former hay-meadows should be mown (and afterwards grazed where this has been the tradition), whereas former pasture can be grazed.
2. Grazing should also be practised according to traditional methods. A mixture of cattle and horses gives good grazing results. Sheep should be avoided. The number of head should be restricted to what the area can carry without supplementary feeding. Every few years some manual clearing is usually necessary to remove plants avoided by cattle.
3. Continuity of management is essential. An area is often not proposed as a nature reserve until it has already become threatened and management has ceased. In such cases negotiations between authorities and owner (private or otherwise) must be concluded in the shortest possible time so that management can be resumed.
4. Ground-water conditions must be maintained or restored. This is a difficult task as regards the water table, and often even more difficult as regards the quality of the ground water.
5. Fertilizers should not be applied. This includes areas adjacent to the fen grassland site.

The development of new fen grassland sites

The systematic examination of the plans for sand-pits and gravel-pits in areas with calcareous soils would probably reveal the presence of many potential fen grassland sites. In such cases cosmetic landscaping should be avoided, and mowing or grazing will be the only management required after colonization.

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